The Relationship Between Poverty and Economic Growth Revisited

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Abstract

It has been shown in prior research that increased economic growth reduces poverty. Authors have also found that the effect of growth in GDP on poverty growth has either diminished or remained unchanged over time and the 1980s economic expansion in the U.S. had no affect on poverty. Using a formal error-correction model, we find that increases in economic growth are significantly related to reductions in the poverty rate for all families. Specifically, GDP growth was found to have a more pronounced effect on poverty during the expansionary periods of the 1960s, 1970s, 1980s, 1990s, and 2000s. Other findings include identification of determinants of the dynamic behavior of poverty rates both in the year-to-year periods and over the long-run.

**JEL Codes:** C32, I32, O40

**Keywords:** poverty, economic growth, income inequality, error-correction, cointegration

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Introduction

According to the U.S. Census Bureau statistics, poverty rates have declined precipitously since 1959.\(^1\) The official poverty rate has decreased from 22.4 percent of families in poverty in 1959 to 12.7 percent in 2004. Prior research in this area of study has concluded that this large decline in poverty rates may in fact be due to increased economic growth (Plotnick and Skidmore (1975), Aaron (1967), Perl and Solnick (1971), and Adams (2002). Of course, this progression of poverty rates may have also resulted from other factors, such as increases in transfer payments, more efficient labor markets, or from auspicious developments in the areas of education or discrimination (Thornton, et. al., (1978)).

From a policy perspective, as long as there is a strong negative correlation between economic growth and poverty that is expected to last into the future, then there may be less need for government programs that are intended to specifically reduce poverty. Consequently, it is important to know whether changes in the relationship between GDP and poverty will endure for the present and into the future.

Many of the early investigations into the “trickle-down” model of economic growth in the U.S. have confirmed that economic growth alleviates poverty by increasing employment and/or the real wage (Anderson (1964), Thornton, et al. (1978), and Hirsh (1980)). Since past empirical studies have shown that growth and income inequality are not related, sustained economic growth should have a large or more than proportionate effect on the poverty rate by raising everyone’s income including the poor.\(^2\) One of the

\(^1\) http://www.census.gov/hhes/income/histinc/histpovtb.html

\(^2\) The empirical studies will be presented in the next section.
discoveries of current research on this theme is that the economic expansion of the 1980s did not reduce poverty significantly. Both Blank (1993) and Formby, et al. (2001) found that poverty in the 1960s was more responsive to economic expansion than it was in the 1980s. An explanation given was the sluggish growth of U.S. real wages in the 1980s—real wages of low-income workers rose by only one half of one percent during the 1980s expansion (Formby, et. al. (2001)). However, real wages can remain stagnant while real incomes increase due to improved employment opportunities. Real wages increased in the 1990s expansion by only one tenth of one percent, yet poverty declined by 3.7 percent.³

In this paper, we will investigate the dynamic relationship between economic growth and poverty in the context of a formal, error-correction model. While previous authors have estimated regressions using differenced variables, these model specifications have not allowed for the prospect of an error-correcting or “long-run” relationship among poverty and its time series’ determinants. Moreover, failure to consider this may have biased the results of previous studies, since the error-correcting term was omitted. We will also include a measure of income inequality as a determinant of poverty. In addition to analyzing the expansionary periods of the 1960s and 1980s, as prior studies have done, we will also include the 1970s, 1990s and 2000s. The time period utilized for this analysis is from 1959 to 2004 and the frequency is annual.

³ http://www.haverselect.com
Literature Review and Past Model Specifications

Poverty, Economic Growth and Inequality

Do the poor benefit from economic growth? On one hand, it is argued that the potential effect of economic growth on poverty rates is offset either entirely or in part by an increase in income inequality. Alternatively, economic growth may reduce poverty by raising the incomes of everyone in society, including the poor (Dollar and Kraay (2001)). The former assertion finds its roots in the Kuznets’ hypothesis (1955), positing that growth and inequality are related through an inverted “U” shaped function. The implication here is that if economic growth leads to increased inequality, then the growth effect on poverty would be tenuous at best. The problem with the Kuznets’ hypothesis (1955) is that the relationship between economic growth and inequality was derived from cross sectional data, e.g., using countries at different points of development at the same point in time, whereby what was really needed to test the hypothesis would be time series data (Adams (2002)). There are a number of empirical studies that have rejected the Kuznets’ hypothesis (1955) (Ravallion (1995), Deininger and Squire (1996, 1998), Schultz (1998), and Bruno, et. al. (1998).

There appears to be a consensus in the literature that economic growth does not have much of an impact on inequality, because income distributions do not change appreciably over time. Deininger and Squire (1996) found that gross domestic product per capita increased by 26 percent in the developing world between 1985 and 1995, while Gini coefficients changed by only 0.28 percentage points over the same period. Our investigation into this relationship utilizing more current econometric techniques yielded
comparable results, e.g., it was found that over the period 1959 to 2004, inequality, as measured by the Gini coefficient, was not cointegrated with Gross Domestic Product.\(^4\)

There is some evidence that economic growth has reduced poverty in developing countries. Squire (1993) found that a ten percent increase in the growth rate reduced poverty across a sample of countries by 24 percentage points. In a similar study by Bruno, et. al. (1998), a ten percent increase in growth was associated with a 21.2 percent decrease in the poverty rate for a sample of 20 countries over the period 1984-1993.

There is also evidence that changes in inequality can affect changes in poverty, \textit{ceteris paribus}. In the same aforementioned study by Bruno, et. al. (1998), the authors realized a positive and statistically significant elasticity estimate of 3.86 on the inequality variable (Gini coefficient), leading them to conclude that “even small changes in the overall distribution of inequality can lead to sizeable changes in the incidence of poverty” (Bruno, et. al. (1978). However, rising income inequality could also be associated with declines in poverty rates. This could result from a “burst” in technological change that would create fortunes for entrepreneurs/managers and contemporaneously improve the wages of those at the bottom of income scale. This occurred during the Industrial Revolution in Britain and the information technology “boom” in the United States. Moreover, higher skill levels required by new technology create a demand for advanced education and training. An increase in the quantity and quality of education would generate a wider disparity between skilled and unskilled workers--contributing to greater income inequality. A better educated labor force is also associated with declines in

\(^4\) For reasons of brevity, these results were not included in this study but will be made available upon request from the authors.
poverty. The poverty rate in 2004 among college educated persons is 4.3 percent compared to 11.9 percent for those who have high school education.5

**Empirical Specifications**

Using time series data, previous authors who conducted research on this topic utilized regression analysis with variables that were either first differenced or percent differenced, e.g., in first differenced form,

\[
\Delta P_t = \beta_0 + \beta_1 \Delta GDP_t + \beta_2 \Delta U_t + \beta_3 \Delta TR_t + \beta_4 \Delta FEM_t + \beta_5 D \cdot \Delta GDP_t + \epsilon_t, \tag{1}
\]

where,

- \(\Delta P_t\) - change in family poverty rate
- \(\Delta GDP_t\) - change in gross domestic product,
- \(\Delta U_t\) - change in the male unemployment rate,
- \(\Delta TR_t\) - change in transfer payments,
- \(\Delta FEM_t\) - change in number of female headed households,
- \(D\) - dummy variable,
- \(D \cdot \Delta GDP\) - interaction term.

Multiple interaction terms may also be present. They are included in these types of models in order to ascertain whether the impact of growth on poverty is dissimilar for different years—the dummy variable would represent different time periods. Thornton, et al. (1978) found this interaction term to be negative and statistically significant in the post 1963 period relative to the 1947-1963 period—concluding, (in their words), that “trickle-down has petered-out.” At least three of the above explanatory variables have been used in model specifications in past research.6

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5 [http://pubdb3.census.gov/macro/032005/pov/new29_100_01.htm](http://pubdb3.census.gov/macro/032005/pov/new29_100_01.htm)
The specification of equation (1) is rather typical. Economic growth is calculated by the change or percentage change in GDP, while the other variables serve as controls. Thornton, et al. (1978) and Blank (1993) point out that female-headed households demonstrate above average poverty rates, and increases in the male unemployment rate are undoubtedly associated with increases in poverty. The male unemployment rate is used because it is more stable than the overall rate (Formby, et. al. (2001)). However, as argued by Blank (2003), there are conflicting results concerning the effect of transfer payments on poverty. According to Wallace and Blank (1999), transfer payments cannot only directly reduce poverty, but can cause those in poverty to find employment as there are reductions in welfare case loads. Alternatively, some authors such as Rector and Lauder (1995) believe in the welfare dependency hypothesis; that is, transfer programs can increase poverty by diminishing the incentives to look for and maintain gainful employment. The impact that transfers have on poverty is therefore theoretically ambiguous and becomes an empirical question.

The use of only first differences or percent changes in the estimation of equation (1) has yielded some rather interesting results. Formby, et. al. (2001) estimated equation (1) over the period 1961 to 1996 (annual data) and utilized two interaction terms in order to determine whether the effect that economic growth had on changes in overall poverty was different during the economic expansions of the 1960s (1962-1972) and the 1980s (1983-1989), relative to the other years in the sample. The coefficient on the 1960s economic expansion interaction term was negative and statistically significant, while the coefficient on the 1980s interaction term was statistically insignificant. Thus, during the economic expansion of the 1960s, the effect of strong economic growth on changes in
poverty was greater than it was in the 1980s and the result of robust economic growth in the 1980s on changes in poverty was not statistically different from zero. Formby, et. al. (2001) also found that neither a percentage change in transfer payments nor in the number of female-headed households had a statistically significant effect on changes in the poverty rate. These are interesting results, since it is well documented that a single-earner family is more likely to be in poverty than a multiple earner family. The authors’ reason for the statistical insignificance of the number of female-headed households is what they believe to be the use of a wrong variable. Rather than the number of female-headed households, the number of *never-married* female heads was used, since they are a demographic group with the highest poverty rates. However, when utilizing this new variable, they still could not find a statistically significant relationship. As far as transfer payments are concerned, the authors (Formby, et. al. (2001)) simply stated that since the sign of the coefficient is positive but statistically insignificant, there is no support for the welfare dependency hypothesis. As will be mentioned shortly, it is our contention that these anomalous results reported by Formby, et. al. (2001) and others may be due to the fact that their models are miss-specified which could lead to bias and consistency problems with the regression estimators.

In a current paper by Enders and Hoover (2003), a threshold regression and a Fourier approximation model is fit to poverty-economic growth data.\(^7\) They conclude

\[ y_t = \alpha(t) + \varepsilon_t, \]  
where \( \alpha(t) = A_0 + \sum_{k=1}^{s} \left( A_k \sin \frac{2\pi k}{T} \cdot t + B_k \cos \frac{2\pi k}{T} \cdot t \right) \). \( s \) is the number of frequencies in the process \( \alpha(t) \) (Enders and Hoover (2003)).
that there is a large and significant effect on poverty as a result of the 1980s expansion—
**which runs counter to the findings of previous studies on this subject.** The authors
make the case that their specifications provide a better empirical model of poverty than
what was done in prior research. However, they also fail to take into account the
possibility of cointegrating relationships and as such, the resulting Fourier and threshold
model specifications may also be miss-specified.

Finally, there are problems associated with using the overall poverty rate as the
criterion variable. We use the standard measure of poverty which is formally defined in
the United States in absolute terms and is measured by the number of persons with
equivalence scale adjusted incomes below the “Orshansky” poverty line (Orshansky
(1965.1, 1965.2). It has been acknowledged that ever since the influential contribution of
Sen (1976), headcount measures of poverty are problematic because there are other
aspects of the income distribution that are ignored. For example, if only the headcount
matters, income could be redistributed from the poorest of the poor to families slightly
below the poverty line and the official poverty measure would decrease. Sen (1976)
demonstrates that when the head count ratio and average income shortfall (poverty gap)
of the poor are both constant, a rise in income inequality among the poor necessarily
increases the economic deprivation among the poor. In their study, Formby, et. al. (2001)
utilizes the *Sen index* which is sensitive to headcount poverty, the income shortfall of the
poor, and the distribution of income among the poor (Formby, et. al. (2001)). However,
use of this superior measure did not yield any substantive differences in their econometric
results, e.g., the differences in magnitudes and statistical significance of the coefficients
between the equation using absolute poverty (headcount measure) as the dependent
variable and the equation using the Sen measure were virtually the same.\(^8\) Thus, there is
evidence that use of the absolute poverty measure should not invalidate our results.

**An Error-Correction Model**

It is our contention that any empirical results that emanate from the estimation of
equation (1) may be subject to misspecification error. What is missing is the notion of an
equilibrium long-run relationship and the introduction of past disequilibrium as an
explanatory variable in equation (1) that would specify the short-run, dynamic behavior
of current variables. It is important to note that the term “equilibrium” as used here does
not have anything to do with market clearing or the equality of actual and desired
quantities. Rather, it refers to any long-run relationship that may exist among the
nonstationary variables, e.g., when \( \eta_{t-1} = 0 \) in equation (4) below. Engle and Granger
(1987) state that this could be defined as any causal, behavioral, or reduced-form
relationship among commonly trending variables (Enders (2004)).

Since the effect economic growth has on poverty depends on the extent of
inequality, inequality must be controlled for in any poverty function (Adams (2002)).
Our specification including the disequilibrium term and Gini coefficient is,

\[
\Delta P_t = \gamma + \alpha \eta_{t-1} + \sum_{j=1}^{p} \beta_{Pj} \Delta P_{t-j} + \sum_{i=1}^{p} \beta_{GNIi} \Delta GNI_{t-i} + \sum_{j=1}^{p} \beta_{UIj} \Delta U_{t-j} + \sum_{i=1}^{p} \beta_{TRi} \Delta TR_{t-i} + \sum_{i=1}^{p} \beta_{FEMi} \Delta FEM_{t-i} \\
+ \sum_{i=1}^{p} \beta_{UNi} \Delta UN_{t-i} + \sum_{i=1}^{p} \beta_{IMMi} \Delta IMM_{t-i} + \sum_{i=1}^{p} \beta_{j} \Delta GDP_{t-j} + \sum_{i=1}^{p} \sum_{j=1}^{k} \theta_{ij} \Delta GDP_{t-j} \cdot D_j + \varepsilon_t,
\]

(2)

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States: Comparisons of Estimates Based Upon Official Poverty Statistics and Sen’s Index of Poverty*,
Working Paper, University of Alabama, Table II, Model 5 and 6.
\[ D_1 = 1 \text{ when } 1961 \leq t \leq 1969 \]
\[ = 0 \text{ otherwise,} \]
\[ D_2 = 1 \text{ when } 1971 \leq t \leq 1973, \ 1976 \leq t \leq 1979 \]
\[ = 0 \text{ otherwise,} \]
\[ D_3 = 1 \text{ when } 1983 \leq t \leq 1989 \]
\[ = 0 \text{ otherwise,} \]
\[ D_4 = 1 \text{ when } 1991 \leq t \leq 1999 \]
\[ = 0 \text{ otherwise,} \]
\[ D_5 = 1 \text{ when } t = 2000, \ 2002 \leq t \leq 2004 \]
\[ = 0 \text{ otherwise.} \]

\[
\eta_{t-1} = \psi_0 + \psi_1 P_{t-1} + \psi_2 GINI_{t-1} + \psi_3 U_{t-1} + \psi_4 TR_{t-1} + \psi_5 FEM_{t-1} + \psi_6 UN_{t-1}
\]
\[ = +\psi_7 IMM_{t-1} + \psi_8 GDP_{t-1} \]

(4)

All of the numeric variables are in natural logs which mean that we are dealing with approximate annual growth rates. Moreover, all coefficients may be interpreted as elasticities. The descriptive statistics for the first difference of each variable may be found in Appendices I and II, respectively. Note that in addition to series of lagged values for each variable, equation (2) contains \( \eta_{t-1} \) which represents the long-run relationship among the variables (equation (4)). We incorporated more expansionary periods than has been utilized in previous studies. The five expansionary periods are in the 1960s, 1970s, 1980s, 1990s and 2000s (as denoted in (3) above). The reference or

\[ \Delta Ln(P_t) = Ln(P_t) - Ln(P_{t-1}) = Ln \left( \frac{P_t}{P_{t-1}} \right) \]

Since the annual growth rate is

\[ \frac{P_t - P_{t-1}}{P_{t-1}}, \ Ln \left( \frac{P_t}{P_{t-1}} \right) = Ln \left( 1 + \frac{P_t - P_{t-1}}{P_{t-1}} \right) \approx \frac{P_t - P_{t-1}}{P_{t-1}}. \]

10 The variables were downloaded from http://www.haverselect.com, a fee based on-line service.
11 These periods have been identified as expansions by the National Bureau of Economic Research (http://www.haverselect.com).
base category is the recession time periods since 1959. Thus, each of the coefficients, $\theta_j$, in equation (2) above can be compared to the coefficient, $\beta_i$, and with each other.

It is important to note that we included two explanatory variables in equation (2) that have not appeared in previous studies: the unionization rate, $UN$, and the number of immigrants entering the United States, $IMM$. Both of these factors have been recently identified as affecting poverty rates. During the period between 1979 and 1995, lower skilled workers experienced a significant decline in real earnings relative to their more highly skilled counterparts. Contemporaneously, the share of workers earning poverty-level wages increased from 23.5% to 29.7% (Mishel, et al., (1997)). Freeman and Katz (1994) demonstrate that controlling for other labor supply and demand factors, institutional determinants such as unionization also played important roles in explaining poverty.

There is some controversy as to the nature and magnitude of the affect of immigration on domestic poverty rates. Data from the 2000 Census indicate that the U.S. poverty rate fell less than one percentage point between 1989 and 1999, dropping from 13.1% to 12.4%. In California and New York, the poverty rate was higher in 1999 than in 1989. Given the strong economy of the latter 1990s, these were confounding figures. One explanation for these phenomena is a growing immigrant population—recent immigrants are likely to be poor and account for a growing share of the poor population (Camarota (1999)). This view is by no means without merit; since it is true that the immigrant share of the population increased over the decade and that the incomes of immigrants are lower than natives’ incomes, on average. However, it is a mistake to
conclude that since immigration expanded and immigrants have lower incomes, the increase in poverty must be due to immigration. It is an empirical question, since immigration may not be the only or most important factor behind increases in poverty.

If $\theta_j < 0$, then economic growth has reduced poverty more during the $j$th expansionary period relative to the recessionary periods ($\beta_i$). Moreover, if $|\theta_i| < |\theta_j| < |\theta_{i-1}| < |\theta_0|$, then the impact of growth on poverty during economic expansions has diminished over time—or in the vernacular of Thornton, et. al. (1978), “trickle down has petered out.” Finally, we specify equation (2) in an error-correction form assuming that $P_t, GINI_t, U_t, TR_t, FEM_t, UN_t, IMM_t$, and $GDP_t$ are cointegrated, e.g., their time paths are influenced in a stationary way by the extent of any deviation from long-run equilibrium where $\alpha_i$ is the speed of adjustment parameter.

**Estimation and Empirical Results**

All of the variables should be integrated of order one ($I(1)$) or have a unit root in order for the specification of equation (2) to be valid. The results of performing the Phillips-Perron unit root tests (Phillips and Perron (1988)) on each explanatory variable are presented in Table I.\(^{12}\) The null hypothesis of a unit root could not be rejected in each case.

[ Insert Table I Here ]

We use the maximum eigenvalue test developed by Johansen (1996) to test for cointegration among the variables $P_t, GINI_t, U_t, TR_t, FEM_t, UN_t, IMM_t$, and $GDP_t$. The

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\(^{12}\) The Phillips-Perron tests are used because of the less stringent assumptions regarding the distribution of the error terms in the unit root model specifications.
results are found in Table II and only one cointegrating relationship is indicated at $\alpha = .01$. Thus, the variables poverty, inequality, the male unemployment rate, federal, state, and local social welfare payments, the number of female-headed households, the unionization rate, immigration to the United States, and gross domestic product all appear to have a common, stochastic trend.

[ Insert Table II Here ]

Normalizing on $tP$, equation (4) may be expressed as, $^{13}$

$$P_t = \lambda_0 + \lambda_1 GINI_t + \lambda_2 U_t + \lambda_3 TR_t + \lambda_4 FEM_t + \lambda_5 GDP_t + \lambda_6 UN_t + \lambda_7 IMM_t + \theta_t.$$  \hspace{1cm} (5)

Equation (5) was estimated using the Phillips and Hansen (1990) method which amounts to including a differenced term at lag one, zero, and a differenced term of lead one for each explanatory variable and correcting for serial correlation.\(^{14}\) The parameter estimates of the relevant terms may be found in Table III.\(^{15}\)

[ Insert Table III Here ]

All of the explanatory variables are statistically significant at most $\alpha = .10$ except for immigration. Remembering that the estimated coefficients are elasticities, from a hierarchical perspective, the level of inequality (GINI), unionization (UN), and GDP, respectively, appears to be the most dominant in explaining long-term movements in the poverty rate. It is important to note that the above results may or may not hold in the short-run—that is, for year-to-year changes in these variables.

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\(^{13}\) The normalizing factor is $-\frac{\psi_i}{\psi_t}$.

\(^{14}\) This method controls for serial correlation and endogeneity.

\(^{15}\) We did not include the coefficients of all the lead and lag terms for reasons of brevity. Complete results are available upon request from the authors.
The estimation results of the error-correction model (equation (2), above) may be found in Table IV. The coefficient on the economic growth variable during the recessionary periods is statistically insignificant—the implication being that economic growth has no affect on poverty during economic downturns. The percentage change in poverty growth as a result of a one percent increase in economic growth for each expansionary period was,\(^{16}\)

\[
\begin{align*}
1960s: & \quad -2.3321 \text{ percent}, \\
1970s: & \quad -1.5465 \text{ percent}, \\
1980s: & \quad -1.8105 \text{ percent}, \\
1990s: & \quad -2.1360 \text{ percent}, \\
2000s: & \quad -2.1842 \text{ percent}.
\end{align*}
\]

Discounting the high growth rate in the 1960s, it appears from an initial perusal of the above elasticity coefficients that the effect of economic growth on poverty has increased since the 1970s expansion (\(\hat{\theta}_{70s} < \hat{\theta}_{80s} < \hat{\theta}_{90s} < \hat{\theta}_{00s}\)), leading us to anecdotally reject the proposition that “trickle down has petered out” (Thornton, et. al. (1978)). However, it is prudent to test the null hypothesis \(\theta_{70s} = \theta_{80s} = \theta_{90s} = \theta_{00s}\)--the results of which are shown on the bottom of Table IV. Given the outcomes, we must fail to reject the null hypothesis with a P-Value of .8776--indicating that there is no statistically significant difference among the elasticity coefficients from the 1970s to the 2000s expansions and indeed “trickle down has petered out” since the 1970s. However, contrary to some previous findings, it must be noted that the effect of economic growth on poverty during the 1980s was statistically significant and “elastic” in magnitude—a one percent increase in

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\(^{16}\) The elasticities are computed by adding -.1595, the coefficient of economic growth during the recessionary periods, to each interaction coefficient for each expansionary period.
economic growth was associated with a 1.8 percent decline in poverty growth during the 1980s expansion.17

[ Insert Table IV Here ]

While the male unemployment rate, number of female-headed households, and unionization affect poverty in the long-run, the growth in these variables do not influence poverty in the year-to-year, error-correction equation. As far as the growth in male unemployment is concerned, the result is consistent with the importance of a cyclical component—the effect of changes in the male unemployment rate on changes in poverty is small when controlling for economic growth. It is also important to note that short run empirical result runs counter to what has been replicated in past studies, which have found unemployment to have a rather large and statistically significant affect on poverty rates.18 According to Thornton, et al. (1978), unemployment is included in the model to control for the “last hired-first fired” syndrome. Our results imply that policies improving economic growth may deliver a larger “bang for the buck” as far as changes in poverty are concerned, than labor market policies dealing directly with male unemployment rates, ceteris paribus.

The explanatory variable, growth in the number of female-headed households, does not significantly affect poverty growth in the short run. As mentioned previously, this variable is one of the factors that explain long-term movements in poverty (see Table III). This result that favors the long-term is not surprising, since the rise in the number of single-parent households over the past 50 years has been a dominant and controversial

17 By “elastic,” we mean a more than proportionate response.
factor in the composition of poverty rates. One reason given for this increase has to do with the corresponding reduction in poverty among other demographic groups in the economy over the long-term. Increases in Social Security payments have reduced the incidence of poverty among the elderly and the Supplemental Social Security program, introduced in 1973, has reduced poverty among the disabled (Wentworth and Pattison (2002)).

State, local, and federal social welfare payments do not only influence poverty over the long-term, but changes in these benefits also have a statistically significant and negative impact on changes in poverty over a year-to-year basis. These results emphasize the importance of the role of transfer payments in poverty reduction. In Table IV, a one percent increase in transfers is associated with a .44 percent reduction in poverty growth.

It is interesting to note that income inequality which is measured by the Gini coefficient is positively related to poverty in the long-run (Table III), but the growth in inequality is inversely related with poverty growth in the error correction results (Table IV). Thus on a year-to-year basis, increases in the growth of inequality are associated with decreases in poverty growth. It was mentioned previously how this relationship could occur. A “spurt” in technological change would yield income gains for entrepreneurs/managers and contemporaneously improve the wages of those at the bottom of income scale—much like what occurred in the United States during the 1990s information technology “boom.” In addition, higher skill levels that are required by new technology create a demand for advanced education and training, which would generate a wider disparity between skilled and unskilled workers and contribute to greater income inequality.
The decline of unionization has been shown in this study to significantly increase poverty over the long-run, but it has had no affect on poverty growth in the short-run. This is no surprise, since in the United States the demise of unions has reduced the earnings of lower-skilled workers over the long-run. However, immigration has been shown to have no influence on poverty, ceteris paribus, both in the long and short-term. As mentioned previously, it is a mistake to conclude that more immigrants with lower incomes account for a significant amount of the increase in poverty rates, since immigration is clearly not the most important factor influencing poverty.

**Conclusion**

The “trickle-down” effect of economic growth is an important issue in policy debate. Anderson (1964) hypothesized that poverty in America would become less responsive to economic growth and new policies would be needed if poverty were to be reduced. He believed that a considerable proportion of the poor were made up of children, the elderly, and the disabled who were incapable of full-time work. These groups were simply not affected by the poverty-reducing effects of economic growth. Blank and Card (1993) have shown that U.S. government poverty statistics have become less sensitive to economic growth across time. As a consequence, growth is believed to have become less effective as a poverty-fighting tool than it was in the 1960s (Formby, et. al. (2001)).

An alternative hypothesis is that an increasing rate of economic growth has an even greater influence on the reduction of poverty. The implication here is that some workers may not be hired under normal growth conditions, but may find increased employment opportunities during periods of high and sustained economic growth.
We have found that while increases in economic growth are indeed significantly related to reductions in the poverty rate for all families, *ceteris paribus*, economic growth has become less effective as a poverty-reducing tool than it was during the 1960s. Using an appropriately specified error-correction model, we have shown that economic growth has had a statistically significant and pronounced effect on poverty during the economic expansions of the 1960s, 1970s, 1980s, 1990s, and 2000s, but that the effect has not changed significantly over time. This is in agreement with some previous studies that have posited the effect of economic growth on changes in poverty to have either declined or remained unchanged over time, e.g., the most recent being the aforementioned analysis by Formby, et al. (2001). However, our results do not support the contentions of previous analyses that the effect of substantial economic growth on changes in poverty was not statistically significant during the 1980s. During this period, the effect of a one percent increase in GDP growth was associated with a 1.81 percent decline in poverty growth.

In this study, we have formulated a model that is more theoretically and statistically valid than what has been used in prior studies. In previous analyses of the growth-poverty relationship, there has never been mention of a “long run” relationship among the variables of interest--nor has the time series properties of the relevant variables ever been analyzed.
References


References (Continued)


References (Continued)


Appendix I

Data Sources

<table>
<thead>
<tr>
<th>Variable</th>
<th>Years</th>
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</thead>
<tbody>
<tr>
<td>P - Poverty Rate, All Families (%)</td>
<td>1959 - 2004</td>
</tr>
<tr>
<td>GINI - Gini Coefficient</td>
<td>1947 - 2004</td>
</tr>
<tr>
<td>U - Male Unemployment Rate (%)</td>
<td>1948 - 2004</td>
</tr>
<tr>
<td>FEM - Number of Female Headed Households (000s)</td>
<td>1947 - 2004</td>
</tr>
<tr>
<td>UN - Union Membership as a Percentage of Total Wage and Salary Workers (%)</td>
<td>1948 - 2004</td>
</tr>
<tr>
<td>IMM – Immigration to the United States</td>
<td>1929 - 2004</td>
</tr>
<tr>
<td>GDP - Gross Domestic Product (Chained) (Bil. 2000 $)</td>
<td>1929 - 2004</td>
</tr>
</tbody>
</table>
## Appendix II

### Descriptive Statistics

Natural Log of First Differences (Annual Growth Rates)

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>GDP</th>
<th>GINI</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.631779</td>
<td>14.93831</td>
<td>-0.966198</td>
<td>1.640681</td>
</tr>
<tr>
<td>Median</td>
<td>2.591509</td>
<td>15.05145</td>
<td>-0.994256</td>
<td>1.661398</td>
</tr>
<tr>
<td>Maximum</td>
<td>3.109061</td>
<td>16.19094</td>
<td>-0.825536</td>
<td>2.295896</td>
</tr>
<tr>
<td>Minimum</td>
<td>2.406945</td>
<td>13.36209</td>
<td>-1.055553</td>
<td>1.017643</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.188075</td>
<td>0.813470</td>
<td>0.073341</td>
<td>0.311492</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>TR</th>
<th>FEM</th>
<th>UN</th>
<th>IMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>5.355608</td>
<td>9.678216</td>
<td>3.087419</td>
<td>12.52519</td>
</tr>
<tr>
<td>Median</td>
<td>5.740568</td>
<td>9.751503</td>
<td>3.193975</td>
<td>12.74361</td>
</tr>
<tr>
<td>Maximum</td>
<td>6.604288</td>
<td>10.41277</td>
<td>3.548139</td>
<td>14.41828</td>
</tr>
<tr>
<td>Minimum</td>
<td>3.699411</td>
<td>8.695841</td>
<td>2.495859</td>
<td>10.04620</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.924414</td>
<td>0.535403</td>
<td>0.341968</td>
<td>1.097665</td>
</tr>
</tbody>
</table>
Table I
Phillips-Perron Unit Root Tests

Null Hypothesis: Variable has a Unit Root

<table>
<thead>
<tr>
<th>Variable</th>
<th>PP Test Statistic</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log of Poverty Rate</td>
<td>-2.08</td>
<td>.54</td>
</tr>
<tr>
<td>Log of Gini</td>
<td>-1.86</td>
<td>.66</td>
</tr>
<tr>
<td>Log of Male Unemployment Rate</td>
<td>-3.14</td>
<td>.11</td>
</tr>
<tr>
<td>Log of Real State, Local, and Federal Social Welfare Payments</td>
<td>-1.01</td>
<td>.93</td>
</tr>
<tr>
<td>Log of Number of Female-Headed Households</td>
<td>.22</td>
<td>.99</td>
</tr>
<tr>
<td>Log of Union Membership as Percent of Wage and Salary Workers</td>
<td>-3.01</td>
<td>.14</td>
</tr>
<tr>
<td>Log of Immigration to the United States</td>
<td>- .88</td>
<td>.79</td>
</tr>
<tr>
<td>Log of Real Gross Domestic Product</td>
<td>-2.58</td>
<td>.29</td>
</tr>
</tbody>
</table>
Table II
Johansen Maximum Eigenvalue Test

\[ H_0 : r \]
\[ H_1 : r + 1 \]

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigenvalue</th>
<th>Max-Eigen Statistic</th>
<th>0.01 Critical Value</th>
<th>Prob.**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None *</td>
<td>0.843713</td>
<td>81.66675</td>
<td>58.66895</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.666880</td>
<td>48.36709</td>
<td>52.30821</td>
<td>0.0291</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.579551</td>
<td>38.12302</td>
<td>45.86900</td>
<td>0.0817</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.435076</td>
<td>25.12682</td>
<td>39.37013</td>
<td>0.3765</td>
</tr>
<tr>
<td>At most 4</td>
<td>0.368767</td>
<td>20.24352</td>
<td>32.71527</td>
<td>0.3246</td>
</tr>
<tr>
<td>At most 5</td>
<td>0.260034</td>
<td>13.25068</td>
<td>25.86121</td>
<td>0.4294</td>
</tr>
<tr>
<td>At most 6</td>
<td>0.206228</td>
<td>10.16220</td>
<td>18.52001</td>
<td>0.2015</td>
</tr>
<tr>
<td>At most 7</td>
<td>0.023522</td>
<td>1.047355</td>
<td>6.634897</td>
<td>0.3061</td>
</tr>
</tbody>
</table>

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.01 level

* denotes rejection of the hypothesis at the 0.01 level

**MacKinnon-Haug-Michelis (1999) p-values
Table III
Regression Results

(All Variables are Expressed as Natural Logarithms)

Dependent Variable: $P_t$
Sample (adjusted): 1960 - 2004
Included observations: 45 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>z-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>11.68012</td>
<td>4.030470</td>
<td>2.897954</td>
<td>0.0038</td>
</tr>
<tr>
<td>GINI&lt;sub&gt;t&lt;/sub&gt;</td>
<td>0.723588</td>
<td>0.299369</td>
<td>2.417049</td>
<td>0.0156</td>
</tr>
<tr>
<td>U&lt;sub&gt;t&lt;/sub&gt;</td>
<td>0.226129</td>
<td>0.044214</td>
<td>5.114388</td>
<td>0.0000</td>
</tr>
<tr>
<td>TR&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-0.288362</td>
<td>0.134862</td>
<td>-2.138208</td>
<td>0.0325</td>
</tr>
<tr>
<td>FEM&lt;sub&gt;t&lt;/sub&gt;</td>
<td>0.247462</td>
<td>0.101919</td>
<td>2.428026</td>
<td>0.0152</td>
</tr>
<tr>
<td>UN&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-0.638389</td>
<td>0.235538</td>
<td>-2.710346</td>
<td>0.0067</td>
</tr>
<tr>
<td>IMM&lt;sub&gt;t&lt;/sub&gt;</td>
<td>0.010755</td>
<td>0.021991</td>
<td>0.489053</td>
<td>0.6248</td>
</tr>
<tr>
<td>GDP&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-0.505064</td>
<td>0.293362</td>
<td>-1.721641</td>
<td>0.0851</td>
</tr>
</tbody>
</table>

Adjusted R-squared: 0.970262
S.E. of regression: 0.030305
Durbin-Watson stat: 2.017452
F-statistic: 144.5588
Prob (F-statistic): 0.000000
## Table IV

Error Correction Model

Estimation Results

Dependent Variable: $\Delta P_t$

Sample (adjusted): 1961 - 2004

Included observations: 44 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.067519</td>
<td>0.026357</td>
<td>2.561692</td>
<td>0.0159</td>
</tr>
<tr>
<td>$\hat{\eta}_{t-1}$</td>
<td>-0.135979</td>
<td>0.053813</td>
<td>-2.526880</td>
<td>0.0115</td>
</tr>
<tr>
<td>$\Delta P_{t-1}$</td>
<td>0.142930</td>
<td>0.230239</td>
<td>0.620788</td>
<td>0.5396</td>
</tr>
<tr>
<td>$\Delta GINI_{t-1}$</td>
<td>-0.936426</td>
<td>0.501367</td>
<td>-1.867746</td>
<td>0.0719</td>
</tr>
<tr>
<td>$\Delta U_{t-1}$</td>
<td>-0.018767</td>
<td>0.103693</td>
<td>-0.180983</td>
<td>0.8576</td>
</tr>
<tr>
<td>$\Delta TR_{t-1}$</td>
<td>-0.446039</td>
<td>0.217118</td>
<td>-2.054358</td>
<td>0.0491</td>
</tr>
<tr>
<td>$\Delta FEM_{t-1}$</td>
<td>0.192089</td>
<td>0.472463</td>
<td>0.406569</td>
<td>0.6873</td>
</tr>
<tr>
<td>$\Delta UN_{t-1}$</td>
<td>-0.015518</td>
<td>0.043846</td>
<td>-0.256199</td>
<td>0.8120</td>
</tr>
<tr>
<td>$\Delta IMM_{t-1}$</td>
<td>-0.159508</td>
<td>0.831281</td>
<td>-0.191882</td>
<td>0.8492</td>
</tr>
<tr>
<td>$\Delta GDP_{t-1}$</td>
<td>-2.172555</td>
<td>0.542406</td>
<td>-4.005401</td>
<td>0.0004</td>
</tr>
<tr>
<td>D60S* $\Delta GDP_{t-1}$</td>
<td>-1.386961</td>
<td>0.539220</td>
<td>-2.572162</td>
<td>0.0155</td>
</tr>
<tr>
<td>D70S* $\Delta GDP_{t-1}$</td>
<td>-1.650983</td>
<td>0.527815</td>
<td>-3.127956</td>
<td>0.0040</td>
</tr>
<tr>
<td>D80S* $\Delta GDP_{t-1}$</td>
<td>-1.976442</td>
<td>0.732275</td>
<td>-2.699044</td>
<td>0.0115</td>
</tr>
<tr>
<td>D90S* $\Delta GDP_{t-1}$</td>
<td>-2.024721</td>
<td>0.912242</td>
<td>-2.219500</td>
<td>0.0344</td>
</tr>
</tbody>
</table>

Adjusted R-squared 0.576059
S.E. of regression 0.035101
Durbin-Watson stat 2.268277
F-statistic 5.173519

Prob (F-statistic) 0.000093

$H_0: \theta_{70x} = \theta_{90x} = \theta_{90x} = \theta_{00x}$

Wald Test: Chi Square = 0.6813, df = 3

Prob = 0.8776